

# Diagnosis of Nutrient Deficiencies in Peanut and Soybean

*R.W. Bell, D. Brady, D. Plaskett, G. Kirk and J.F. Loneragan, School of Environmental and Life Sciences, Murdoch University, Perth, W.A., Australia.*

PLANT analysis is widely used for both the diagnosis and prediction of nutrient deficiencies. In this study, standards have been developed for the diagnosis of deficiencies of phosphorus, potassium, sulfur, zinc and copper at defined growth stages in peanut cv. White Spanish and soybean cv. Buchanan.

Peanut and soybean were grown under glasshouse conditions with graded levels of the element under study. Various leaf, petiole and stem tissues were sampled at defined stages of growth; concentration of the element under study was related to shoot dry weight to obtain a critical concentration.

For most elements, the youngest fully expanded leaf blade (YFEL) was satisfactory for deficiency diagnosis, thereby simplifying sampling procedures. However, for reliable diagnosis the following points need to be considered:

a. For particular elements, such as copper and boron (Kirk and Loneragan, these proceedings) younger leaf tissues (youngest open leaf in soybean and youngest folded leaf in peanut) were preferable for deficiency diagnosis.

b. Petioles generally had different nutrient concentrations to leaf blades and should be excluded from tissues sampled.

c. Critical concentrations can vary between successive leaves. In soybean, critical zinc concentrations varied twofold between the YFEL (6  $\mu\text{g/g}$  on day 35) and the next youngest leaf (12  $\mu\text{g/g}$ ). Critical concentrations of phosphorus and potassium also exhibited substantial variation with leaf age. Variation in critical concentrations between the YFEL and the next oldest leaf was less of a problem for sampling, but in the field these older leaves are less valuable as they are more likely to suffer insect damage. Thus, careful sampling according to defined leaf age is necessary.

d. For potassium, a marked decline in critical concentrations in the YFEL was obtained for both peanut and soybean with increasing plant age. In soybean, the decline in critical potassium concentration (2.0–2.2% at day 26 to 0.35–0.4% at day 55) was not related to stage of development, as it occurred in plants which flowered and set pods as well as in plants which remained vegetative throughout the experiment.

Standards developed for deficiency diagnosis are now being evaluated in field grown peanut and soybean in Thailand.

---

## Responses of Pigeonpea to Lime on an Oxisol in Fiji

*A.L. Cowie, Dept. Agronomy & Soil Science, Univ. of New England, Armidale, Australia;  
G.E. Rayment, Agricultural Chemistry Branch, Qld. D.P.I. Indooroopilly, Australia; and V. Chand,  
M.P.I., Legalega Research Station, Fiji.*

NUTRITIONAL problems associated with soil acidity are common in the highly weathered soils of the tropics. The low productivity of the 'Talasiga' soils of Fiji (acidic Oxisols) is possibly due to Al toxicity associated with low pH (Rayment and Wallis 1981). Although pigeonpea is reputed to have low fertility requirements, its tolerance of Al was unknown (Whiteman et al. 1985).

Five different lime rates up to 4.8 t/ha  $\text{CaCO}_3$ , were incorporated to 10, 20 and 30 cm three months prior to sowing pigeonpea cv. Hunt, an early-maturing photoperiod-insensitive line. At sowing, 40 kg P/ha as triple superphosphate was broadcast and 20 kg P, 10 kg Mg, 2 kg Zn, 250 g B and 100 g Mo/ha was banded beside the seed. Six weeks after sowing, 50 kg K/ha was broadcast.

The soil had an initial pH (1:5 soil/ $\text{HO}_2\text{O}$ ) of 5.1, an effective cation exchange capacity (ECEC) below 30 mmol ( $\text{p}^+$ )/kg, and Al saturation of about 45% of the ECEC at the surface, rising to 60% at 30 cm. The highest lime rate increased pH to 5.8 and reduced the Al saturation in the top 20 cm to about 5%.

Vegetative yields at flowering were increased slightly by liming (Table 1). Excessive flower drop during abnormally prolonged flowering period resulted in widely varied seed yields within each treatment, from which no meaningful assessment of the seed response to lime was possible. Vegetative yields at maturity were not affected by lime and exceeded 6 t/ha in all treatments.